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Cavity quantum electrodynamics with quantum dots in microcavities

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Title: Cavity quantum electrodynamics with quantum dots in microcavities

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Propositions

Belonging to the thesis:

“Cavity Quantum Electrodynamics with Quantum Dots in Microcavities”

1. In-situ monitoring in combination with a fast characterization technique offers a reliable route towards the controlled wet thermal oxidation of micropillars.
Chapters 3,4 of this thesis
2. Strain-induced birefringence prevents polarization degeneracy in circular oxide apertures, but can be fully compensated for through elongated oxide shapes.
Chapter 5 of this thesis
3. In a polarization degenerate microcavity, interference of differently polarized quantum dot transitions can be used to assess the coherence of these transitions.
Chapter 6 of this thesis
4. Trapped charges, although typically being of great annoyance in solid-state devices, can also offer a rich wealth of physics.
Chapter 7 of this thesis
5. A homodyne detection technique offers a straight forward way to characterize coherence of a QD transition.
Chapter 8 of this thesis
6. Oxide-aperture micropillars are the most promising approach towards quantum information with charge controlled QDs in polarization degenerate microcavities.
7. The photon polarization or path degrees of freedom are more suitable for scalable quantum information applications than the photon frequency or arrival time degree of freedom.

8. 'Bright' (literally meaning 'giving out a lot of light') is a rather vague term to classify ones system, as is for example indicated by the recorded photon count rates by 'Gazzano *et al.*', that are less than 20% of the count rates presented by 'Strauf *et al.*'.
O. Gazzano et al., Nat. Comm. 4, 1425 (2013) and S. Strauf et al., Nat. Phot. 1, 704 (2009)
9. The proposal for the generation of N-photon states is another example of a solution seeking for a problem, just like the quantum computer, or the laser.
C. Sánchez Muñoz et al., Nat. Phot. 8, 550 (2014)
10. An intuitive understanding of core principles is more important than knowing all the right formulas.
11. The unequal growth of wealth compared to that of income can be fully attributed to housing and property wealth. Therefore, Thomas Piketty's proposal for a global wealth tax should be replaced by more efficient housing regulations, that for example allow more houses to be built, or by implementing a land value tax.
M. Rognlie, (2014)
12. The top of Dutch football will never rejoin the top of the European league, as long as AFC Ajax keeps selling their best players every summer.
13. Doing a PhD in physics is a lot like playing tennis: tennis requires hard work, a broad range of skills and techniques, mental strength, passion, having the right equipment, and above all one should never forget that the match is only over once the last point has been played.

Morten P. Bakker
Leiden, 17 June, 2015